

# Index

## A

### ABO<sub>3</sub>

- general formula, 1, 2, 29, 73
- perovskite, 1, 2, 6, 37, 108
- type perovskite structure, 1, 3, 73, 74

### AC

- magnetization, 45, 61
- susceptibility, 26, 27, 45, 54, 56, 61, 62, 64, 69, 88, 109, 124, 133

Activation energy, 126, 133, 153

Actuating devices, 28

AFM. *See* Antiferromagnetic (AFM)

Ag, 26

Aging phenomena/behavior, 66

Almeida–Thouless line, 26

Al<sub>2</sub>O<sub>3</sub>, 8

Anderson–Goodenough–Kanamori rules, 13

Anisotropic

- energy, 109
- exchange interaction, 10
- magnetic interaction, 10
- MR. *See* magnetoresistance

Anomaly

- dielectric, 107, 119, 135
- $\lambda$ , 134

Antiferromagnetic (AFM)

- A-type, C-type, G-type, CE-type, 10, 11, 49
- charge ordered, 18, 39, 40, 49, 52
- clusters, 24, 121, 126, 127, 137
- competitions, 23
- components, 124, 133
- domains, 24, 39, 133
- insulator/insulating, 10, 13, 18
- interactions, 22–25, 70, 121, 133, 137, 151
- matrix, 24, 38, 89, 109, 150
- ordering, 10, 11, 67, 98, 136, 149
- phases, 24, 38, 49
- region, 95, 96

state, 14, 95, 96, 98

system, 13

transition, 10, 94

Antiferromagnetically, 10, 26, 52, 84, 149

Antiferromagnetism, 37

Anti-phase boundary, 151

Arrhenius law, 14

Atmosphere

- oxygen, 5, 7
- pressure, 7, 78, 106

Atomic force microscopy, 21

Atomic spin glass, 69

Au, 26

## B

Ba/Bao, 75, 77, 78

BaMF<sub>4</sub>, 30

Band

- conduction, 8, 14, 82
- diagram, 82
- $e_g$ , 18, 62, 82
- gap/energy gap, 8
- valence, 8
- widths, 2
- narrowing, 47

BaPb<sub>1-x</sub>Bi<sub>x</sub>O<sub>3</sub>

superconducting, 9

Basal plane distortion, 81

BaTiO<sub>3</sub>

ferroelectric, 2, 9

Bi-centred

- FMI. *See* ferromagnetic insulator
- perovskite, 106, 121, 127, 130, 133, 137, 155

BiFeO<sub>3</sub>, 3, 30, 106, 136, 149

BiMnO<sub>3</sub>, 106

BiMn<sub>0.5</sub>Ni<sub>0.5</sub>O<sub>3</sub>, 31, 106

Bi<sub>2</sub>MnNiO<sub>6</sub>, 3, 111

- Bismuth (Bi), 1, 31, 108, 119, 121, 149
- Bond angle, 3, 4, 12, 18, 93, 152
- Boundaries/boundary  
 grain, 94, 97–99, 115, 116, 127–129, 134, 141, 144, 146, 147, 155  
 twin, 134
- Bonds -covalent/ $\sigma/\pi/\text{Co-O}$ , 13, 29, 74, 81, 83
- Bridgman and Stockbarger, 6
- Butterfly-like, 99
- C**
- $\text{Ca}_2\text{Fe}_2\text{O}_5$ , 2
- Capacitance (C)  
 bulk grain, 129, 142  
 grain boundary, 98, 128, 129, 134, 141
- $\text{Ca}_2\text{Mn}_2\text{O}_5$ , 2
- $\text{CaMn}_7\text{O}_{12}$ , 106
- $\text{CaCO}_3$ , 5, 7
- $\text{Ca}_3\text{Co}_2\text{O}_6$ , 4
- Canonical spin-glass, 109
- Canted antiferromagnetism (CAF), 106
- Cation-anion-cation interaction, 9, 13, 14
- Cation-cation interaction, 9
- Cation size mismatch, 87
- $\text{CdCr}_2\text{Se}_4$ , 106
- Charge carriers, 14, 20, 93, 100, 114, 126, 140, 146
- Charge densities, 21, 37, 39, 89
- Charge-localized matrix, 39
- Charge ordered/ordering (CO), 1, 18, 37
- Cluster glass, 57, 122, 124, 132, 149
- Clusters-ferromagnetic (FM)/antiferromagnetic (AFM), 1, 2, 10, 17, 27, 31, 37, 38, 43–46, 49, 51–53, 58, 61–63
- Cobaltites  
 ordered perovskite, 16, 24, 73, 75, 80, 83, 85, 86, 90, 92  
 disordered perovskite, 20, 75, 85, 90–92
- Coercive field, 23, 63, 92, 95, 96, 99, 112, 121, 122, 136
- Colossal dielectric constant, 115
- Conduction  
 band, 8, 14, 82  
 electrons/holes, 18, 20, 97
- Conductivity  
 electrical, 12–14, 84, 142  
 metallic, 9, 93  
 percolative, 43  
 p-type polaronic, 110, 133  
 thermal, 14, 100
- $\text{Co}_3\text{O}_4$ , 5, 7
- Coulomb  
 energy, 21  
 forces, 21, 126  
 interaction, 21, 39, 127
- CMR nanoparticles, 24, 39
- CMR perovskite cobaltites  
 cobalt, 1, 17, 19, 20, 23, 57, 62  
 cationic ordering, 31, 74, 83  
 electrical properties, 14, 57, 86, 88, 121  
 magnetic and electron transport properties, 8, 37, 38, 52, 62  
 spin states, 28, 62  
 valence, 83
- CMR. *See* Colossal magneto resistance
- Cobalt perovskites  
 cobaltites, magnetic/transport properties, 24, 38  
 electrical resistivity, 15, 46, 87  
 ferrimagnetism/ferromagnetism, 1, 12, 18, 27, 28, 38, 45, 48, 63, 74, 84, 86, 88, 90, 105, 110, 136  
 frustration, 25, 27, 62  
 magnetic susceptibility, 38, 131  
 magnetoresistance, 1  
 thermoelectric power, 100, 110, 114, 115  
 ZFC/FC magnetization data, 27, 45, 53, 54, 63, 64, 95, 108, 113, 121, 123, 131, 137, 148, 150, 152
- $\text{CrO}_2$ , 2
- $\text{Cr}_2\text{O}_3$ , 28, 106
- $\text{Cr}_3\text{B}_7\text{O}_{13}\text{Cl}$ , 30
- Crystal field  
 energy, 23, 82  
 splitting ( $\Delta_{\text{cf}}$ ), 82  
 theory, 81
- Crystallographic magnetic structures, 75, 83
- Crystal structure  
 cobalt perovskites, 75, 77  
 perovskites, 149
- Cubic structure/perovskites, 2–5
- $\text{CuMn}$ , 27
- $\text{CuO}_2$ , 3
- Cuprates, 2
- Curie temperature, 1, 51, 52, 64, 69, 73, 132, 133
- Curie–Weiss behavior, 63, 95, 128
- Curie–Weiss fit, 94
- Curie–Weiss paramagnetism, 9
- Czochralski method, 6
- D**
- DC  
 conductivity, 129, 139, 142, 147, 153  
 magnetic susceptibility, 63  
 magnetization data, 27, 56, 63, 68, 69
- Debye, 28, 128
- Defect ordering, 2

- Degree of freedom, 30, 84  
 Delocalized superexchange, 13  
 Dielectric  
   anomaly, 107, 119, 135  
   behavior, 43, 115, 117, 128, 134, 140, 156  
   constant, 29, 115, 119, 127–130, 134, 137, 139–141, 146, 155, 156  
   loss ( $\tan \delta$ ), 115, 147, 156  
   magneto, 28, 105–107, 110, 117, 119, 121, 127, 134  
   properties, 31, 107, 115, 121, 129, 130  
   permittivity ( $\epsilon_r$ ), 115  
   response, 115, 139, 142  
 Diffraction  
   neutron, 10, 21, 22, 49, 76, 77  
   X-ray, 7, 21, 49, 76, 78, 106  
 Diluted magnetic semiconductors, 106  
 Dipolar type relaxation, 140  
 Direct exchange, 13  
 Disorder  
   induced insulator-metal transition, 87  
   materials, 29, 57  
   magnetic, 26, 55  
   size, 2, 19, 23, 37, 38, 41, 46–48, 57, 63, 74, 84, 86–90  
   spin, 15, 17, 25  
   structural, 25, 75  
 Disordered  
   cobaltites (perovskite), 74, 75, 84  
   cubic perovskite, 4, 74, 78  
   ferromagnetic phase, 1, 56, 66  
   magnetically, 57, 89  
   manganites, 91, 92  
   phase, 20, 92  
   structure, 74  
 Divalent alkaline earth, 73  
 Domain growth model, 54, 66  
 Double-exchange (DE)  
   mechanism, 37, 83, 84  
   model, 12, 13  
   Zener, 11  
 Droplet scaling model, 26  
 Doublet state, 82  
 $\text{Dy}_{0.5}\text{Sr}_{0.5}\text{CoO}_3$ , 121
- E**  
 Efros- Shklovskii (ES) conductivity, 14, 126  
 Efros- Shklovskii - type hopping (ESH), 14, 97, 126  
 Einstein equation, 12
- Electrical resistance, 15  
 Electric polarization, 136  
 Electronic band width, 41, 87  
 Electronic phase separation (EPS)  
   electrical resistivity, 11  
   magnetic and electron transport properties, 38  
   magnetic susceptibility, 38, 94  
   magnetoresistance, 83  
   ZFC/FC magnetization data, 53, 54  
 Energy band gap, 87, 127, 153  
 Epitaxial thin films, 106, 107, 117  
 ESH. *See* Efros- Shklovskii - type hopping (ESH)  
 $\text{EuBaCo}_{1.92}\text{Mn}_{0.08}\text{O}_{5.5\pm\delta}$ , 24  
 $\text{EuBaCo}_2\text{O}_{5.5\pm\delta}$ , 24  
 EuO, 8  
 EuSe, 20  
 $\text{Eu}_{1-x}\text{Sr}_x\text{S}$ , 27  
 EuTe, 20
- F**  
 FeO, 3, 13  
 $\text{Fe}_2\text{O}_3$ , 8  
 $\text{Fe}_{1-x}\text{O}$ , 4  
 Ferrimagnetic  
    $-\text{Fe}_3\text{O}_4$ , 2  
 Ferroelectricity (FE), 28, 29  
 Ferromagnetic (FM)  
   and ferroelectric (FE), 2, 105  
   Curie temperature,  $T_C$ , 1, 51, 69, 73  
   clusters, 11, 17, 19, 22, 24, 37, 45, 46, 48, 53, 57, 61, 62  
   droplets, 20, 57  
   insulator (FMI), 31, 44, 105, 106  
   metallic (FMM), 11  
   ordering, 20, 48, 68, 109, 113, 124, 126, 132, 133  
   phase, 1, 56, 66  
   transition, 11, 12, 19, 23, 39, 49, 51, 61, 84, 87, 88, 94, 112, 121, 122, 124, 126, 127, 131, 150  
 Ferromagnetic-paramagnetic (FM/PM) ratio, 89  
 Ferrotoroidicity, 28  
 Field cooling (FC), 56  
 Field-cycling, 70  
 Frequency  
   dependent, 116, 119, 127, 128, 139, 141, 155

- independent, 62
  - Frequency-dependent cusp, 27
  - Frequency dispersion plot, 155
  - Frustrated ferromagnetic phase, 56, 66
  - Frustrated magnets, 30
- G**
- Gd<sub>0.5</sub>Ba<sub>0.5</sub>CoO<sub>3</sub>, 84, 86–88
  - GdBaCo<sub>2</sub>O<sub>5.5</sub>, 17, 95, 97, 100
  - GdBaCo<sub>2</sub>O<sub>5+Δ</sub>, 76
  - GdBaCo<sub>2</sub>O<sub>5.5+Δ</sub>, 17, 24
  - Gd<sub>0.7</sub>Ba<sub>0.3</sub>MnO<sub>3</sub>, 56
  - Gd<sub>0.7</sub>Ba<sub>0.3</sub>MnO<sub>3</sub>, 45, 46, 53, 55, 56
  - Gd<sub>2</sub>Mo<sub>3</sub>O<sub>12</sub>, 2
  - Gd<sub>0.5–x</sub>Nd<sub>x</sub>Ba<sub>0.5</sub>CoO<sub>3</sub>, 86, 87
  - Gd<sub>0.5</sub>Sr<sub>0.5</sub>CoO<sub>3</sub>, 88, 89
  - Giant dielectric constant, 139
  - Glassy
    - ferromagnetism, 27, 89, 91
    - ferromagnets, 121, 137
    - magnetic behavior/phase, 19, 68–70, 90, 91
- H**
- Half-filled orbitals, 13
  - Heat capacity, 23, 134
  - Heisenberg
    - spin glass, 26
    - system, 26
  - High-spin (HS) states, 62, 133
  - HoBaCo<sub>2</sub>O<sub>5.3</sub>, 77
  - HoBaCo<sub>2</sub>O<sub>5.5</sub>, 81, 100
  - Hole-doped
    - perovskite cobaltite, 11, 22, 67
  - Hole-rich FM clusters, 68
  - Hopping dynamics/models, 14, 101, 126
  - Hund's coupling, 82
  - Hund's rule
    - intraatomic exchange energy, 23, 82
- I**
- Insulator–metal transition (TIM), 1, 73
  - Insulators, 2, 8, 13–15, 17, 84, 105, 115
  - Intermediate- spin (IS) state, 62, 70, 82
  - Inverse
    - (magnetic) susceptibility, 38, 108, 132
    - magnetization, 49
  - Iodometric titrations, 5
  - Irreversibility temperature (T<sub>irr</sub>), 68
  - Irreversible MR, 99
  - Ising spin glass, 26
- Isothermal**
- M(H), 95, 99, 144, 151
  - MR, 17, 98, 99, 125
- J**
- Jahn–Teller (JT) distortion
    - CoO<sub>6</sub>octahedra, 81, 83
  - Joule heating, 52
  - JT active, 133
  - JT effect, 81, 82
- K**
- K<sub>0.3</sub>MoO<sub>3</sub>, 2
  - KNbO<sub>3</sub>, 2
  - K<sub>2</sub>NiO<sub>4</sub>structure, 5
- L**
- La<sub>0.7–x</sub>Ln<sub>x</sub>Ca<sub>0.3</sub>CoO<sub>3</sub> series, 62
  - La<sub>0.25</sub>Nd<sub>0.25</sub>Ca<sub>0.5</sub>MnO<sub>3</sub>, 19
  - La<sub>0.5</sub>Ba<sub>0.5</sub>MnO<sub>3</sub>, 20, 92
  - La<sub>0.5</sub>Bi<sub>0.5</sub>Mn<sub>0.67</sub>(Co/Ni)<sub>0.33</sub>O<sub>3</sub>, 107, 113
  - La<sub>0.5</sub>Sr<sub>0.5</sub>Co<sub>1–x</sub>Ru<sub>x</sub>O<sub>3</sub>, 17
  - La<sub>0.67</sub>Ca<sub>0.33</sub>MnO<sub>3</sub>, 15
  - La<sub>0.6</sub>Bi<sub>0.4</sub>Mn<sub>0.6</sub>(Fe/Ni)<sub>0.4</sub>O<sub>3</sub>, 107, 121
  - La<sub>0.7–x</sub>Ln<sub>x</sub>Ba<sub>0.3</sub>MnO<sub>3</sub>, 46, 47
  - La<sub>0.7</sub>Sr<sub>0.3</sub>Co<sub>1–x</sub>Ga<sub>x</sub>O<sub>3</sub>, 17
  - La<sub>0.85</sub>Sr<sub>0.15</sub>CoO<sub>3</sub>single crystal, 17
  - La<sub>0.8</sub>Bi<sub>0.2</sub>Mn<sub>1–y</sub>Fe<sub>y</sub>O<sub>3</sub>, 142, 144–148
  - La<sub>0.8</sub>Sr<sub>0.2</sub>Co<sub>1–x</sub>Mn<sub>x</sub>O<sub>3</sub>, 17
  - La<sub>1–δ</sub>Mn<sub>1–δ</sub>O<sub>3</sub>, 16
  - La<sub>1–x</sub>A<sub>x</sub>CoO<sub>3</sub>, 16, 23
  - La<sub>1–x</sub>A<sub>x</sub>MnO<sub>3</sub>, 14, 15
  - La<sub>1–x</sub>Bi<sub>x</sub>Mn<sub>1–y</sub>Fe<sub>y</sub>O<sub>3</sub>, 107, 130
  - La<sub>1–x</sub>Bi<sub>x</sub>MnO<sub>3</sub>, 106
  - La<sub>1–x</sub>Ca<sub>x</sub>CoO<sub>3</sub>, 27, 91
  - La<sub>1–x</sub>Sr<sub>x</sub>CoO<sub>3</sub>, 16, 23, 27, 63, 67, 87, 89
  - (La<sub>1–y</sub>Pr<sub>y</sub>)<sub>1–x</sub>Ca<sub>x</sub>MnO<sub>3</sub>, 21, 39, 40
  - La<sub>2–x</sub>Bi<sub>x</sub>Mn(Co/Ni)O<sub>6</sub>, 149
  - La<sub>2–x</sub>Bi<sub>x</sub>MnNiO<sub>6</sub>, 149
  - La<sub>2</sub>Mn(Co/Ni)O<sub>6</sub>, 3, 106, 149
  - La<sub>2</sub>MnNiO<sub>6</sub>, 111, 150, 153
  - LaBaCo<sub>2</sub>O<sub>5.50</sub>, 76–78, 80, 81, 94, 95, 97, 99, 100
  - LaBaCo<sub>2</sub>O<sub>5.5</sub>, 17, 24
  - LaBaCo<sub>2</sub>O<sub>6</sub>, 77, 78, 80, 92–94, 97–99
  - LnBaM<sub>2</sub>O<sub>5</sub>
  - LaBaMn<sub>2</sub>O<sub>6</sub>, 20, 92
  - LaBiMn<sub>1.5</sub>Ni<sub>0.5</sub>O<sub>6</sub>, 150, 151, 153
  - LaCoO<sub>3</sub>, 9, 68, 82
  - LaCrO<sub>3</sub>, 2

- LaFeO<sub>3</sub>, 9, 131  
 LaNiO<sub>3</sub>, 2, 5, 9  
 (La/Sr)<sub>1-x</sub>Bi<sub>x</sub>Mn<sub>0.5</sub>Fe<sub>0.5</sub>O<sub>3</sub>, 107, 149  
 LaTiO<sub>3</sub>, 9  
 Ln<sub>0.7</sub>Ca<sub>0.3</sub>CoO<sub>3</sub>  
   polycrystalline, 63  
   single crystalline, 63, 69  
 Ln<sub>1-x</sub>A<sub>x</sub>CoO<sub>3</sub>, 1, 17, 22, 27, 57, 62, 74, 75, 83  
 Ln<sub>0.5</sub>Ba<sub>0.5</sub>CoO<sub>3</sub>, 75, 88, 90  
 Ln<sub>0.5</sub>Sr<sub>0.5</sub>CoO<sub>3</sub>  
   Co–O bonds, 81  
   crystal structure, 73  
   electrical properties, 91  
   electronic phase separation, 1, 2, 37, 41, 48, 60  
   electronic structure, 2, 8  
   La-rich (hole-poor) and Sr-rich (hole-rich) regions, 22  
   magnetic properties, 1, 2, 37  
   magnetoresistance (MR), 16, 17, 97, 125  
   neutron diffraction, 21  
   rare earth cobaltites, 74, 83  
   rhombohedral structure, 4  
   spin state transitions, 57  
   thermoelectric power, 100, 114  
 Ln<sub>0.7</sub>Ca<sub>0.3</sub>CoO<sub>3</sub>  
   polycrystalline, 62  
   single-crystalline, 8  
 Ln<sub>1-x</sub>Ca<sub>x</sub>CoO<sub>3</sub>, 90  
 LnBaCo<sub>2</sub>O<sub>5</sub>, 75, 77  
 LnBaCo<sub>2</sub>O<sub>5.4</sub>, 17, 73  
 LnBaCo<sub>2</sub>O<sub>5.5</sub>, 76, 77, 81, 96, 100, 101  
 LnBaCo<sub>2</sub>O<sub>5.5±δ</sub>, 24  
 LnBaCo<sub>2</sub>O<sub>6</sub>  
   disordered and ordered forms, 75, 77  
   HREM image, 79, 80  
   *Pm-3 m* symmetry, 78  
   SAED patterns, 78–80  
   tunneling magnetoresistance (TMR), 16  
 Localization of charge carriers, 100  
 Long-range *FM* ordering, 48, 109  
 Low-spin (LS) state, 62
- M**  
 Magnetic and electron transport, 8, 37, 38, 52, 62  
 Magnetic phase diagram, 11, 68  
 Magnetic phase separation, 62  
 Magnetic relaxation, 27, 64, 66, 69, 70  
 Magnetic susceptibility  
   measurements, 45, 64, 132  
 Magnetization ZFC, 27, 53, 54, 56, 66, 67, 70, 94–96, 131, 133, 151  
 Magnetoresistance (MR)  
   effect, 16, 17  
   Maxwell–Wagner, 117, 119, 129, 146  
   Memory dips, 67, 70  
   Memory effects, 69, 70  
   Mossbauer spectroscopies, 21  
   Mott’s variable range hopping (VRH), 97
- N**  
 Nanoscopic ferromagnetic clusters, 89  
 Nanoscopic phase separation, 24, 68  
 NdBaCo<sub>2</sub>O<sub>5+δ</sub>, 77  
 NdBaCo<sub>2</sub>O<sub>5.5</sub>, 24, 100  
 NdBaCo<sub>2</sub>O<sub>6</sub>, 93  
 Nd<sub>0.7</sub>Ca<sub>0.3</sub>CoO<sub>3</sub>, 63  
 Nd<sub>0.5</sub>Ba<sub>0.5</sub>CoO<sub>3</sub>, 87, 93  
 Nd<sub>0.5</sub>Pb<sub>0.5</sub>MnO<sub>3</sub>, 15  
 Nd<sub>0.5</sub>Sr<sub>0.5</sub>MnO<sub>3</sub>, 18, 21, 37, 50  
 Nd<sub>0.7</sub>Sr<sub>0.3</sub>MnO<sub>3</sub>, 27, 54  
 Neutron diffraction, 21  
 Nuclear magnetic resonance (NMR)  
   <sup>59</sup>Co, 22  
 Nyquist plot, 116
- O**  
 Octahedral site, 9  
 Ohmic response, 116  
 Orbital ordered phases, 1  
 Ordered-disordered  
   cobaltites, 75, 77  
   perovskite, 75, 92, 93, 97, 99  
   phases, 92  
 Ordered spin glass domains, 66  
 Orthorhombic structure, 4, 63, 75, 77, 78, 91, 111, 121, 130, 149  
 Oxygen  
   annealing, 78  
   content, 73, 76, 77, 83, 113, 132  
   deficiency, 20, 75, 76, 94  
   stoichiometry, 3, 5, 20, 75, 83, 94  
   vacancies, 20, 76, 77
- P**  
 Paramagnetic (PM)  
   matrix, 151  
   phases, 1, 92, 109  
 Pauli paramagnetism, 9  
 PbTiO<sub>3</sub>, 3, 31, 106  
 Planck’s constant, *h*, 12  
 Pm-3m space group, 3, 78  
 PMI. *See* Paramagnetic insulator (PMI), 11  
*Pmmm/ Pnma* symmetry, 77  
 Pr<sub>0.6</sub>Ca<sub>0.4</sub>MnO<sub>3</sub>, 52  
 Pr<sub>0.7</sub>Ba<sub>0.3</sub>MnO<sub>3</sub>, 44–46  
 PrBaCo<sub>2</sub>O<sub>6</sub>, 93

- $\text{Pr}_{0.7}\text{Ca}_{0.3}\text{CoO}_3$ , 63  
 $\text{Pr}_{0.7}\text{Ca}_{0.3}\text{MnO}_3$ , 18, 52
- Q**
- Quadrupolar doublet, 130  
 Quadrupole splitting value  $\Delta E$ , 131  
 Quartz tube, 6, 7  
 Quasi-equilibrium, 54, 66  
 Quasi-one dimensional, 4  
 Quasi-two dimensional, 5
- R**
- Raman  
   active, 119  
   mode, 120  
   spectroscopic, 107  
   spectrum, 120  
 Rare-earth oxide, 5, 7, 9  
 Relative permittivity ( $\epsilon_r$ ), 120  
 $\text{ReO}_3$ , 2–4, 9  
 Reversal of polarization, 135  
 Ruddlesden-Popper phases, 16  
 $\text{RuO}_2$ , 2
- S**
- Scanning electron nanodiffraction, 24, 39  
 Scanning transmission electron microscopy (STEM), 38  
 Scanning tunneling microscope (STM), 21  
 Seebeck coefficient  $S(T)$ , 110, 114, 133  
 Size disorder effect ( $\sigma^2$ ), 19  
 Spin glass (SG)  
   magnetic frustration, 27  
   transition  $T_{\text{sg}}$ , 25–27  
 Spin state transitions, 57  
 $\text{Sr}_{0.5}\text{Bi}_{0.5}\text{Fe}_{0.5}\text{Mn}_{0.5}\text{O}_3$ , 149  
 $\text{Sr}_2\text{FeMoO}_6$ , 16  
 $(\text{SrO})(\text{La}_{1-x}\text{Sr}_x\text{MnO}_3)_n$ , 16  
 Super-paramagnetic droplets, 24  
 Susceptibility, 26, 45, 54, 61, 64, 65, 88, 95, 109, 113, 131, 132, 138
- T**
- $\text{TbBaCo}_2\text{O}_{5.5}$  cobaltites, 24  
 $(\text{Tb}_{0.33}\text{La}_{0.67})_{0.67}\text{Ca}_{0.33}\text{MnO}_3$ , 27  
 Temperature dependence, 52, 54, 55, 58, 63–65, 67, 92, 93, 115, 121, 134, 140, 148, 156
- Tetragonal structure, 4, 76, 77  
 $\text{Th}_{0.35}\text{Ba}_{0.37}\text{Ca}_{0.28}\text{MnO}_3$ , 27  
 Thermal activation (TA) model, 126  
 Thermal conductivity, 100  
 Thermoelectric power, 100, 110, 114, 115  
 Thermomagnetic hysteresis, 132  
 Thermomagnetic irreversibilities, 23  
 Thermopower, 100, 133  
 Thermoremanent magnetization (TRM), 27, 131, 132  
 $\text{Ti}_2\text{Mn}_2\text{O}_7$ , 16  
 $\text{TiO}$ , 4  
 $\text{TiO}_2$ , 8  
 Transition metal oxides (TMO), 1  
 Trivalent lanthanide, 73  
 Tunneling magnetoresistance (TMR), 16
- U**
- Unconventional spin glass, 25  
 Universal dielectric response (UDR)  
   UDR model, 142, 146  
   UDR phenomenon, 146
- V**
- Variable range hopping (VRH)  
   behavior, 97  
   conductivity, 127  
 $\text{V}_2\text{O}_3$ , 2  
 $\text{V}_3\text{O}_5$ , 8  
 $\text{V}_4\text{O}_7$ , 8  
 VRH. *See* variable range hopping (VRH)
- W**
- Weak ferromagnet, 109  
 Weiss temperatures ( $\theta_p$ ), 63  
 $\text{WO}_3$ , 8
- X**
- X-ray diffraction (XRD), 7, 21, 49, 76, 107  
 X-ray powder diffraction (XRPD), 7, 78
- Y**
- $\text{Y}_{0.5}\text{Ca}_{0.5}\text{MnO}_3$ , 19  
 $\text{Y}_{0.7}\text{Ca}_{0.3}\text{MnO}_3$ , 27  
 $\text{YBaCo}_2\text{O}_{5.44}$ , 81  
 $\text{YBaCo}_2\text{O}_{5.5}$   
   perovskite cobaltites, 24  
 $\text{YBaCo}_2\text{O}_5$ , 24

YBaCuFeO<sub>5</sub>, 3, 30, 106

YMnO<sub>3</sub>, 27

## Z

Zener double-exchange, 11, 83

Zener's model, 13

Zero-field condition, 124

Zero-field-cooled (ZFC)

  dc magnetization, 27, 56, 69

  divergence of, 45, 46, 95, 109, 111, 136

  FC divergence, 45, 46, 109, 112, 136, 150

ZFC. *See* Zero-field-cooled (ZFC)